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Two-Piece Nasal Septum Prosthesis for a Large Nasal Septum Perforation: A Clinical Report

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Abstract

Nasal septum perforation presents with the symptoms of epistaxis and crusting. Obturation of the defect will decrease the symptoms and increase patient comfort. Prosthetic closure is more predictable and thus the treatment of choice in larger defects. This article describes a procedure for construction of a magnet-retained, heat-processed acrylic nasal septum prosthesis. The two-piece nasal septum prosthesis was processed and joined together in situ by magnets. Each piece of the septum prosthesis conforms to the remaining medial wall of each nostril and forms the missing half of the nasal septum. The prosthesis not only alleviates symptoms, but also provides structural support to the saddle-shaped nose and improves esthetics.

A nasal septal perforation is a through-and-through defect in any portion of the cartilaginous or bony septum with no overlying mucoperichondrium or mucoperiosteum on either side. Damage to the mucoperichondrium can be infective, traumatic, iatrogenic, inflammatory, chemical, neoplastic, and systemic, which may lead to septal perforation. Many cases have been presented with unknown etiology.[1,2] Perforation localized in the deeper, osseous segment of the septum tends to be less symptomatic because of humidification from the nasal mucosa and turbinates. Anterior perforations usually present various troublesome symptoms arising from altered nasal laminar airflow. The symptom complex includes epistaxis, crusting, whistling sound during inspiration, nasal obstruction, inflammation, secondary infection, nasal discharge, parosmia, neuralgia, and headache.[1,3] Larger perforations can lead to atrophic rhinitis and saddle-nose deformity due to the lack of dorsal nasal support.[4]

Conservative treatment of nasal perforation consists of humidification and emollient application. Patients with persistent symptoms need surgical closure or placement of a nasal septum prosthesis. Surgical closure of septal perforations, though a viable option, can be a difficult endeavor, and is associated with complications and failures.[5] Surgeries are performed based on the etiology, symptoms, extent of damage or impending destruction to the nasal support, and absence of any active disease process.[6] Surgical options, like mucosal flaps,[7] septal shortening,[8] and composite free grafts,[9] are associated with technical challenges due to the tenuous nature of the tissues and limited surgical exposure of the area. The major drawback is significant breakdown at the surgical site, resulting in a larger perforation and vestibular stenosis.[10]

Various prosthetic options are available for closure of septal perforation.[11] Prosthetic closure using a custom-made

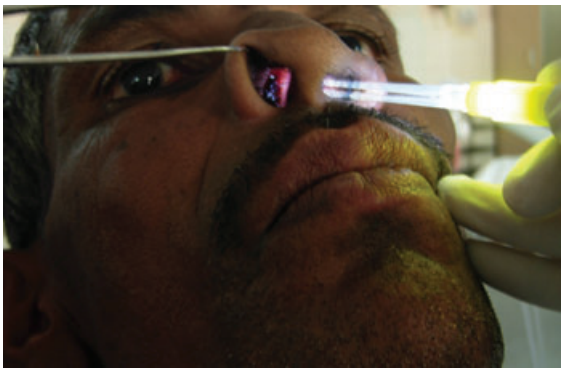

Figure 1 Nasal septum perforation as viewed from the left nostril.

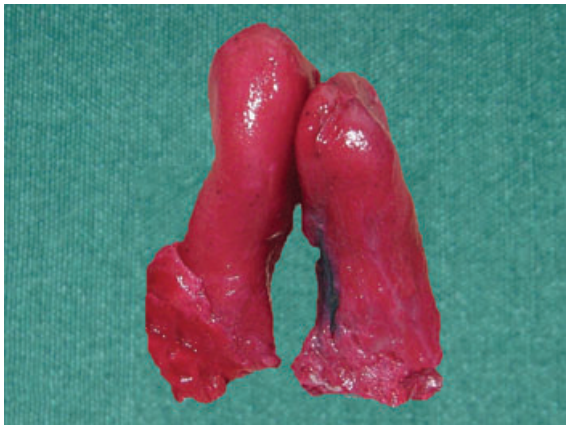

Figure 2 Intranasal impression made with modeling plastic impression compound.

Figure 3 Autopolymerizing acrylic stent serving as a special tray.

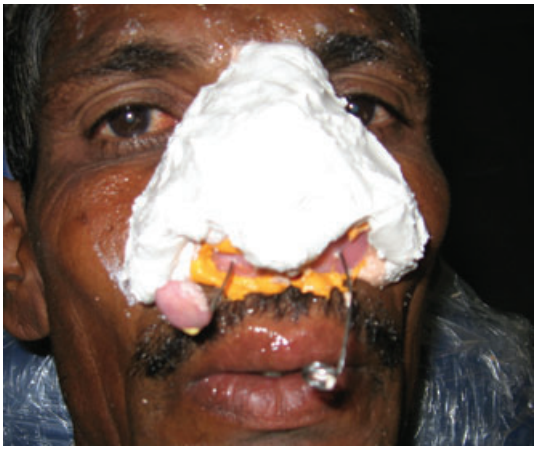

Figure 4 Extranasal impression irreversible hydrocolloid reinforced with dental plaster with intranasal impressions in place.

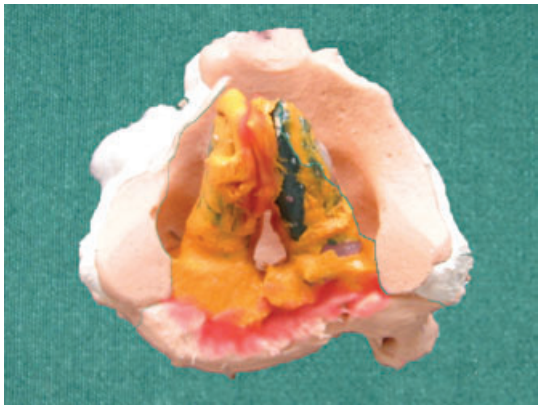

Figure 5 Combined intra- and extranasal final impression stabilized with wax after retrieving.

Figure 6 Formed wax patterns on stone cast.

prosthesis was first proposed by Meyer in 1951.[12] Septal buttons are used for smaller perforations. Silicone septal buttons are either preformed or custom made, and have been commonly used since the 1970s. Prefabricated buttons are typically 2-piece units with a flexible hub and pliable discs allowing them to adapt to the curvatures of the septum.[13] Some clinicians have made two-dimensional tracings of the defect to make a custom-shaped silastic button. The use of blotting paper to soak up mucus, except in the area of perforation, is used to determine the outline of the defect.[14] The dry part is cut out to form a template. A piece of paper is placed in one nasal cavity, and the margins of the perforation are outlined from the other cavity with a cotton ball dipped in thimerosal.[15] Recently,

Figure 7 Left component of the wax pattern in situ being checked for completeness.

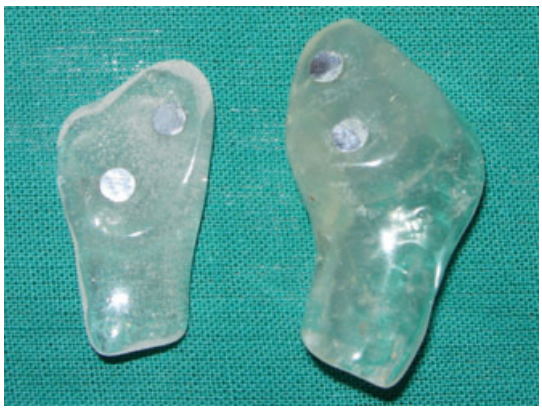

Figure 8 Two-piece nasal prosthesis with positioned magnets.

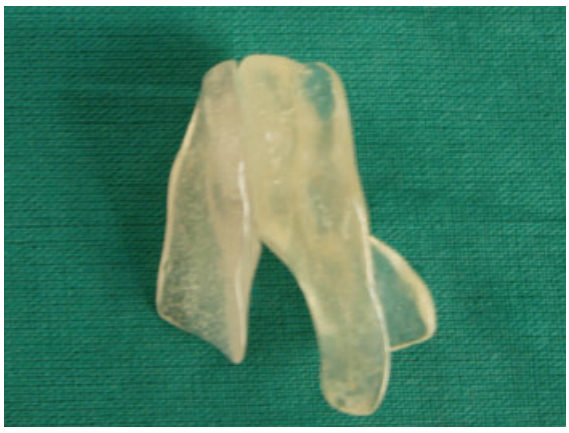

Figure 9 Processed intranasal prosthesis; right and left components attached with magnets.

computed tomography with reformatted images has been used to obtain a 3D image of the defect. It replicates the precise anatomy of the defect to custom fit septal buttons.[11,16–18] Contraindications include septal deviations, absence of nasal spine, patients with active infections, patients who use intranasal drugs, and actively bleeding perforations. Septal silicone buttons are difficult to adapt and to be placed in larger and irregular defects.

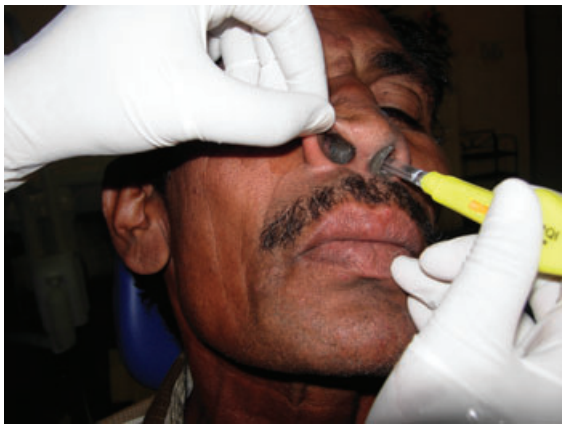

Figure 10 Left component of the prosthesis in situ being checked for completeness.

Prostheses for larger defects have been constructed using an actual impression of the defect.[19–22] Different impression materials like silicone,[19] elastomeric impression material,[20,23] alginate,[24] impression compound,[25] and tissue conditioner[21] are used to record the shape and size of the nasal septum perforation. Two-piece molds are prepared with the impressions, and the prosthesis is processed with medical-grade silicone[11,19,20,23,24,26,27] or heat-processed acrylic resin.[21,22,28–31] Special prosthetic designs like hollow heat processed intranasal inserts,[28,29] or two-piece conformers joined in situ by Velcro-interlocking inserts[30] have been used to improve the structural deformity of the nose and replace the lost nasal septum. The treatment of choice and prosthesis design depends upon the clinical situation, the extent and size of the defect, and the most troublesome symptoms to be alleviated.[13,32]

Clinical report

Clinical findings

The patient (age 42 years) was referred by the ENT Department to the Department of Prosthodontics. The patient complained of bleeding of the nose for 4 months. The bleeding was severe in the mornings, along with continuous headache. The clinical examination showed a collapsed external nose, resulting in a saddle nose deformity. Intranasal examination revealed perforation of the septum. Adjacent tissues showed crusts of blood and mucosa. Crusts were removed carefully with the help of a cotton-tipped applicator for better visibility. The defect was large, measuring 3 × 2.5 cm, and predominantly involved the anterior region of the septum (Fig 1). No specific etiology could be found. Surgical or mechanical obturation of the defect would help alleviate the problem of bleeding and mucus crusting, giving comfort to the patient.

Prosthodontic procedure

Blood and mucous crusts were cleaned with a cotton-tipped applicator. Petroleum jelly was applied to the nasal mucosa to reduce discomfort during impression procedures. A primary impression of each nare was made with modeling plastic impression compound[25] (Y-Dent; MDM Corporation, New Delhi, India). The compound was softened, molded into a cylindrical core, and inserted into each nasal vestibule. Meticulous care was taken to prevent mucosal damage (Fig 2). The obtained impressions could not record the defect area completely, especially the superior and the posterior regions. Stone molds were prepared from the impression. From the stone molds, autopolymerizing acrylic resin stents with handles (Fig 3) were made. Both stents conformed only to the medial two-thirds of each nostril, which helped easy insertion and removal from the nose, and easy separation of the final impression from the cast without sectioning. They served as special trays.

Low-fusing compound—Type 1 (Pinnacle; Dental Products of India Ltd, Mumbai, India) was applied on the medial, posterior, and superior walls of the right stent and placed in the nostril. With the help of the tongue-blade placed in the left nostril, the compound was adapted to the margins of the defect. Then, adaptation in the left nostril was completed by placing the right stent in place. Proper placement and removal of the stents was practiced before making the final impression. Tray adhesive was applied to both the stents and allowed to dry. Light body addition silicone (Reprosil, Dentsply Caulk, Milford, DE) was mixed and applied on the right stent and inserted in the nostril. Petroleum jelly was applied on the defect side of the obtained impression so that impressions on both sides would not adhere to each other, and could be removed easily. The right impression was replaced in the nostril, and an impression of the left nostril was similarly accomplished. Both impressions were checked for completeness.

Proper orientation of both impressions in the lab was necessary to prepare the cast. Impression of the external nasal region along with columella was made with irreversible hydrocolloid (Algitex, DPI, The Bombay Burmah Trading Corporation, Mumbai, India) reinforced with dental plaster (White Gold, Asian Chemicals, Hyderabad, India) (Fig 4). Intranasal impressions and an extranasal impression were attached at the nonimpression surface near the columella and alae region. The extranasal impression and two intranasal impressions were removed as a single unit (Fig 5). Modeling wax was used to seal the minimal gaps between the extra- and intranasal impressions at the nonanatomic region of the impressions. Thus, a rigid extranasal impression stabilized the intranasal impressions in their proper position while maintaining the space between them. A dental stone cast (Kalstone-Karson Pvt Ltd, Mumbai, India) was prepared from the impression.[25]

The cast was the replica of both the external and internal surfaces of the nose, including the precise anatomy of the defect. The two-piece septal prosthesis was waxed (Modelling Wax, Elite Dental Products, Nanded, India) to its form on the cast (Fig 6). Only the medial wall was made in the prosthesis. It extended anteriorly to support the depressed nose, and 5 mm beyond the defect margins. It was evaluated on the patient to verify the fit, extension, and esthetics (Fig 7). The wax form was processed in heat-polymerizing clear acrylic resin (DPI Heatcure; Dental Products of India). The prosthesis was trimmed and highly polished to reduce mucus adhesion to the surface. Two pairs of commercially available magnets (5 mm diameter × 2 mm thick) (Cobalt Samarium, Ambica Corporation, New Delhi, India) were selected. Two 2 × 5 mm depressions, 2 cm apart, were made on the defect side of the left piece, and the magnets were retained with autopolymerizing acrylic resin (Fig 8). Magnets on the right piece were placed with the help of a cast, such that they were in direct contact with corresponding magnets of the left piece when placed in situ (Fig 9).

The prosthesis was placed in the nose, and fit and adaptation were checked (Fig 10). The patient was taught placement, removal, maintenance, and hygiene of the prosthesis. The patient was recalled after 1, 3, and 8 weeks, 6 months, and 1 year for follow-up. After the first week, 50% of the symptoms were relieved. In the following visits, the patient's tissue tolerance to the prosthesis was good, and the patient had relief from epistaxis and headache.

Discussion

Prosthetic closure of the large nasal septum perforation has proved to be safer and more predictable.[11] Cytological investigation has showed positive changes in the nasal epithelium after using the prosthesis.[26] A nasal septum prosthesis is constructed of either medical grade silicone,[11,19,20,23,26,27] or heat-processed acrylic resin.[21,22,28–31] Both materials are biocompatible. The medical-grade silicones cannot be highly polished and are also porous and friable. These inherent problems of silicones may lead to sorption of fluids, irritation of tissues from adhesion of mucus crust, and tearing of the material. It is not durable on a long-term basis, as it lacks inherent physical strength. In contrast, heat-processed acrylic resin is rigid, durable, can be highly polished, has less tendency for water sorption, and mucus crust seldom adheres to its highly polished surface.[28] In this case, the perforation was large, irregular, and actively bleeding. A highly polished prosthesis was required to reduce mucous crusting and bleeding, and a rigid prosthesis was required to support the saddle-shaped deformity of the nose to improve the esthetics. Hence, heat-processed acrylic resin material was used to construct the prosthesis. But as the defect was larger than the stretched nostril and irregular, it was not possible to place a one-unit rigid heat-processed acrylic resin prosthesis. A large nasal septal defect can be indirectly obturated by placing a heat-processed acrylic resin intranasal stent in one of the nasal cavities. The medial wall of the stent formed the partition of the two nasal cavities, and the patency of stent allowed comfortable breathing.[22] A large intranasal stent, when placed in only one nare, will not provide structural support to improve a saddle-shaped deformity, and it may be bulky and uncomfortable to the patient. Heat-processed acrylic resin septal prostheses can be designed in the form of hollow intranasal inserts or two-piece conformers, which when joined in situ by Velcro-interlocking inserts will also provide structural support to the depressed nose.[29,30,32] In this case, a two-piece acrylic resin nasal septum

prosthesis was designed to obturate the perforation. Magnets were used to join the two pieces in situ.

A one-piece extra- and intranasal impression was made. The obtained two intranasal impressions when joined together formed the image of one nasal defect. The extranasal impression stabilized the intranasal impressions in their proper position, allowing the formation of an exact anatomical replica of the defect in the cast. The cast was useful in construction of an accurate prosthesis with precise positioning of magnets. These magnets were small, with strong attractive forces. They not only provided stability and retention to the prosthesis, but also helped to automatically reorient the two pieces intranasally. When joined in situ, the prosthesis was similar to the septal button with two flanges. Each flange extended anteriorly in the alae region to support the depressed nose and 5 mm beyond the defect.

The technique was noninvasive and economic. The heat-processed acrylic resin prosthesis was tissue tolerant, esthetic, durable, comfortable to use, easy to clean and did not obstruct nasal airflow. The patient had significant relief from the symptoms. Thus, a simple noncumbersome prosthesis was prepared, which was functional, therapeutic, biocompatible, esthetic, durable, hygienic, and comfortable. A constant follow-up on a longitudinal basis is necessary for these cases. A complicated case can be treated with minimal equipment. Further investigations may be conducted on use of alloys for preparation of septum prostheses.

Summary

The prosthodontic rehabilitation of a patient with large nasal septum perforation was provided with a magnet-retained two-piece nasal septum prosthesis. The prosthesis involved only the medial wall of the nostril, making it comfortable for the patient to wear. The patient had significant relief from the symptoms. Thus, it may be recommended as an effective alternative treatment for large nasal septum defects.

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